User's Manual

Model DY
Vortex Flowmeter (Integral Type, Remote Type)
Model DYA
Vortex Flow Converter (Remote Type)
FOUNDATION Fieldbus Communication Type

digitalYEWFLO

Manual Change No.14-013V-E

vigilantplant.®

Please use the attached sheets for the pages listed below in IM 01F06F00-01EN (7th).

Page and Item	Contents of Correction
Page 9-2 to 9-7	Add ATEX Intrinsically safe Ex ic
Page 10-1 to 10-15	Add ATEX Intrinsically safe Ex ic

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Yokogawa Electric Corporation

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Mass Flow or Volumetric Flow at Norminal/Standard condition Accuracy using Arithmetic (AR) function block:
(when Multi-Variable Type (option code: /MV), High Process Temperature Version Multi-Variable Type (combination of option code /HT and /MV) and outer pressure sensor are used)
Accuracy ± %: of Reading

Fluid	Mass Flow Accuracy (Note 1, Note 2)	Notes		
		Input for Temperature, Pressure	Reference condition for Mass Flow Accuracy	Flow computing
Saturated steam (Temperature base)	±2.0% (Flow velocity 35m/s or less) ±2.5% (Flow velocity 35m/s to 80m/s)	Temperature	Temperature range +100 to +250°C (/MV) +100 to +330°C (/HT/MV)	Density computing by temperature using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
Saturated steam (Pressure base)		Pressure	Pressure range 0.1MPa to flange rating Pressure accuracy ±0.2%	Density computing by pressure using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
Superheated steam		Temperature and Pressure	Pressure condition: Pressure range 0.1MPa to flange rating Pressure accuracy ±0.2% Temperature condition: Temperature range +100 to +250°C (/MV) +100 to +400°C (/HT/MV)	Density computing by temperature and pressure using standard steam table (IAPWS-IF97: International Associaton for the Properties of Water and Steam)
General gas	Not fixed	Temperature and Pressure	Accuracy is changed by fluctuating deviation factor K on temperature, pressure condition	Temperature, pressure compensation computing using gas equation (Boyle-Charles's) at fixed deviation factor K.
Liquid	Not fixed	Temperature	Accuracy is changed by setting value for temperature compensation factor	Density computing by temperature using equation API • JIS K 2249.
General gas including Natural gas	±2.0% (Flow velocity 35m/s or less) ±2.5% (Flow velocity 35m/s to 80m/s)	Temperature and Pressure	For Natural gas accuracy condition is Pressure condition: Pressure range 0 to 12MPa Pressure signal ±0.2% Temperature condition: Temperature range –10 to + 65°C General gas is computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	For natural gas, AGA No.8 is applied for temperature, pressure compensation computing For general gas and liquid, DIPPR database is applied (AIChE: American Institute of Chemical Engineers) for Mass flow computing. Density calculation parameters are downloaded by FSA120 • FieldMate FlowNavigator (Note 3)
Liquid	Not fixed	Temperature	Computed using physical properties supported by DIPPR database (AIChE: American Institute of Chemical Engineers)	

Note 1) Mass Flow Accuracy for Steam and Natural gas is computed adding by Temperature and Pressure compensation based on Volumetric Flow Accuracy.
Note 2) Refer to GS 01F06A00-01EN about mass and volumetric flow accuracy of AI1 output and temperature accuracy of AI2 output.
Note 3) Refer to GS 01C25R51-01EN.

● Electrical Specifications

Power Supply Voltage:
9 to 32 V DC for general-purpose, flameproof, ATEX intrinsically safe Ex ic (Entity model) and Nonincendive
9 to 24 V DC for intrinsically safe (Entity model)
9 to 17.5 V DC for intrinsically safe and ATEX intrinsically safe Ex ic (FISCO model)

Output Signals:
Digital communication signal compliant with the FOUNDATION Fieldbus protocol

Condition of Communication Line:
Supply voltage: 9 to 32 V DC
Supply current: 15 mA maximum
24 mA maximum for the software download

Functional Specifications:

Functional specifications for Fieldbus communication conform to the standard specifications (H1) of FOUNDATION fieldbus.

FOUNDATION Fieldbus specifications (ITK 5.0.1) grant the interoperability of the field instruments.

Function blocks:

Block name	Number	Execution time	Note
AI	3	29 ms	AI1: Monitors the fow rate and totalized flow rate; AI2: Monitors the temperature for a model with the multi-variable type option; AI3: volumetric flow input for mass flowrate calculation of AR.
DI	2	25 ms	Flow and temperature limit switches
AR	1	40 ms	Mass flow calculation
IT	1	40 ms	Integrator block integrates a variable as a function of the time or accumulates the counts
PID	1	40 ms	Applicable when LC1 option is specified

9.2 Model and Suffix Codes

DY□□□-$^{F}_{N}$ □□□□□-□□/□

DYA-F□□/□

F: digital communication (FOUNDATION Fieldbus protocol)

N: Remote type detector

9.3 Optional Specifications

IMPORTANT

In case of the remote type, select the same specification (code) for both detector and converter.

For options other than below, refer to GS 01F06A00-01EN.
(Note1) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).
(Note2) In case of /KN26, the screw length of Electrical Connection is deeper than ANSI standard for 0.5 to 2 threads.

Item	Description	Code
Multi-variable Type	Provides a temperature sensor (Pt 1000) built-in the vortex shedder bar, enabling the AI2 function block to output the process fluid temperature, and mass flow rates to be calculated. (For details, refer to GS 01F06A00-01EN.)	MV
PID Function	Provides a PID control function block.	LC1
Software download function	Based on FOUNDATION Fieldbus Specification (FF-883) Download class: Class 1	EE
Factory Mutual (FM)	FM explosion-proof Approval Applicable Standard: FM3600, FM3611, FM3615, FM3810, Including Supplement 1 ANSI/NEMA 250 Type of Protection: Explosionproof for Class I, Division 1, Groups A, B, C, and D; Dust-ignitionproof Class II/III, Division 1, Groups E, F, and G. “SEAL ALL CONDUITS WITHIN 18 INCHES.” “WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED.” Enclousure Rating: Type 4X Temperature Code: T6 Ambient Temperature: –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Ambient Humidity: 0 to 100%RH (No condensation) Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating. Electrical Connection: ANSI 1/2NPT female	FF1
	FM Intrinsically Safe Approval, Nonincendive (Note1) Applicable Standard: FM3600, FM3610, FM3611, FM3810, NEMA-250, ANSI/ISA-60079-0, ANSI/ISA-60079-11, ISA60079-27 Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G, T4, and Class I, Zone 0, AEx ia IIB/IIC T4, Entity, FISCO Nonincendive for Class I, II, Div.2, Groups A, B, C, D, F and G, Class III, DIV.1, Class I, Zone 2, Group IIC, FNICO Ambient Temperature : –29 to +60°C (Integral Type Vortex Flowmeter) –29 to +80°C (Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Ambient Humidity : 0 to 100%RH (No condensation) Indoors and Outdoors : Type 4X Electrical Parameters : Intrinsically Safe [Entity] Vmax=24V, Imax=250mA, Pi=1.2W, Ci=3.52nF, Li=0 [FISCO (IIC)] Vmax=17.5V, Imax=380mA, Pi=5.32W, Ci=3.52nF, Li=0 [FISCO (IIB)] Vmax=17.5V, Imax=460mA, Pi=5.32W, Ci=3.52nF, Li=0 Nonincendive Vmax=32V, Ci=3.52nF, Li=0 Electrical Connection : ANSI 1/2NPT female	FS16

Item	Description	Code
ATEX	ATEX Flameproof Approval Applicable Standard: EN 60079-0, EN 60079-1 Type of Protection: II 2 G Ex d IIC T6...T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) II 2 G Ex d IIC T6 Gb (Remote Type Vortex Flow Converter) Group : II, Category : 2 G Temperature Class : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Process Temperature : T6 (–29 to 80°C), T5 (–29 to 100°C), T4 (–29 to 135°C), T3 (–29 to 200°C), T2 (–29 to 300°C), T1 (–29 to 450°C) (Use /HT version above 250°C) Ambient Temperature: –29 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to 60°C (Remote Type Vortex Flow Converter without indicator) –30 to 60°C (Remote Type Vortex Flow Converter with indicator) Ambient Humidity: 0 to 100%RH (No condensation) Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	KF2
	ATEX Intrinsically Safe Approval Ex ia (Note1) Applicable Standard : EN 50014, EN 50020, EN 60079-27, EN 50284 Type of Protection: EEx ia IIB/IIC T4...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) EEx ia IIB/IIC T4 (Remote Type Vortex Flow Converter) Groups: II Category: 1 G Ambient Temperature (Integral Type Vortex Flowmeter): –29 to +60°C Ambient Temperature (Remote Type Vortex Flow Detector): –29 to +80°C Ambient Temperature (Remote Type Vortex Flow Converter): –40 to +60°C Ambient Humidity: 0 to 100%RH (No condensation) Process Temperature : T4; 135°C, T3; 200°C, T2; 300°C, T1;450°C (Use /HT version above 250°C) For connection to certified Intrinsically Safe circuit with Supply circuit of Integral Type Flowmeter and Remote Type Converter: [Entity] Vmax=24V, Imax=250mA, Pi=1.2W, Ci=1.76nF, Li=0 [FISCO (IIC)] Vmax=17.5V, Imax=380mA, Pi=5.32W, Ci=1.76nF [FISCO (IIB)] Vmax=17.5V, Imax=460mA, Pi=5.32W, Ci=1.76nF, Li=0 Connect sensor circuit of DYA and DY-N (/HT) Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	KS26
	ATEX Intrinsically Safe Ex ic (Note1, 2) Applicable Standard: EN 60079-0, EN 60079-11 Type of Protection: Ex ic IIC T4...T1 Gc (Integral Type Vortex Flowmeter) Ex ic IIC T6...T1 Gc (Remote Type Vortex Flow Detector) Ex ic IIC T5...T4 Gc (Remote Type Vortex Flow Converter) Groups/Category: II 3 G Temperature Class: T4...T1 (Integral Type Vortex Flowmeter) T6...T1 (Remote Type Vortex Flow Detector) T5...T4 (Remote Type Vortex Flow Converter) Ambient Temperature: –29 to +60°C (Integral Type Vortex Flowmeter) –40 to +80 [79]°C (Remote Type Vortex Flow Detector) (Option /LT below –29°C, [ ] for Option /MV at T6) –40 to +80°C (Remote Type Vortex Flow Converter without indicator): –30 to +80°C (Remote Type Vortex Flow Converter with indicator): Ambient Humidity: 5 to 100%RH (No condensation) Process Temperature: T6: –196 to 84 [79]°C, T5: –196 to 100°C, T4: –196 to 135°C, T3: –196 to 199°C, T2: –196 to 299 [289]°C, T1: –196 to 449 [439]°C (Option /HT above 250°C and Option /LT below -29°C, [ ] : Option /MV) Signal/Supply (Terminals SUPPLY + and –) Circuit: FISCO field device Ui = 32 V, Ci = 3.52 nF, Li = 0 mH Electrical Connection: ANSI 1/2 NPT female, ISO M20 × 1.5 female	KN26

Item	Description	Code
Canadian Standards Association (CSA)	CSA explosion-proof Approval Applicable Standard: C22.1-98, C22.2 No.0, C22.2 No.0.4, C22.2 No.0.5, C22.2 No.25, C22.2 No.30, C22.2 No.94, C22.2 No.142, C22.2, No.61010-1, ANSI/ISA-12.27.01 Type of Protection: explosion-proof for Class I, Groups B, C and D; Class II, Groups E, F and G; Class III. For Class I, Division 2 locations- "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED." Enclosure: Type 4X Temperature Class: T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Ambient Temperature: –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Process Temperature : T6;85°C, T5;100°C, T4;135°C, T3;200°C, T2;300°C, T1;450°C Enclosure : Type 4X Coating of Enclosure: Epoxy resin coating or Polyurethane resin coating. Electrical Connection: ANSI 1/2NPT female (Special)	CF1
	Process Sealing Certification Dual Seal Certified by CSA to the requirement of ANSI/ISA 12.27.01 No additional sealing required	CF11
IECEx	IECEx Flameproof Approval Applicable Standard: IEC60079-0, IEC60079-1 Type of Protection: Ex d IIC T6...T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Ex d IIC T6 Gb (Remote Type Vortex Flow Converter) Temperature Class : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Process Temperature : T6 (–40 to 80°C), T5 (–40 to 100°C), T4 (–40 to 135°C), T3 (–40 to 200°C), T2 (–40 to 300°C), T1 (–40 to 450°C) (Use /HT version above 250°C) Ambient Temperature: –29 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to 60°C (Remote Type Vortex Flow Converter without indicator) –30 to 60°C (Remote Type Vortex Flow Converter with indicator) Ambient Humidity: 0 to 100%RH (No condensation) Electrical Connection: ANSI 1/2NPT female, ISO M20 × 1.5 female	SF2
Technology Institution of Industrial Safety (TIIS), Japan	TIIS explosion-proof Ex d IIC T6 approval Ambient Temperature: –20 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Electrical connection: JIS G1/2 female	JF3

<Factory setting>

Item	AI1 for Flow Rate Signal (Standard)	AI2 for Temperature Signal (with MV Option)
Tag number (PD_TAG)	Set to "FT1003" by default unless otherwise specified when ordered.	
Output mode (L_TYPE)	"Direct"	
Upper and lower calculation range limits and unit (XD_SCALE)	The upper range limit will be set to the maximum flow rate range specified in the registered sizing data, or to the 0 to 10 m^3/h range in case of UNCALIBRATION.	–40 to +260°C or –40 to +500°F
Upper and lower output range limits and unit (OUT_SCALE) _		
Node address	Set to 0xF2 unless otherwise specified when ordered.	

Explanation of parameters:

(1) XD_SCALE: Defines the input values from the transducer block (input range of the sensor) corresponding to 0% and 100% values in the calculation inside the AI function block. For a digitalYEWFLO, the values set as the flow span or temperature range (option) are stored in this parameter.

(2) OUT_SCALE: Output scaling parameter. Defines the output values corresponding to 0% and 100% values in the calculation inside the AI function block.

(3) L_TYPE: Determines whether the values passed from the transducer block (sensor) should be output without processing ("Direct") or through scaling conversion based on OUT_SCALE ("Indirect").

10. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described except JIS Flame proof. For explosion proof type instrument, the description in this chapter is prior to other description in this Instruction Manual.

WARNING

- Only trained persons use this instrument in industrial locations.

10.1 ATEX

WARNING

- Only trained persons use this instrument in industrial locations.
- Electrostatic charge may cause an explosion hazard.
  Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on coating face of product.

■ Technical Data

• Flameproof

Applicable Standard : EN 60079-0: 2009,
EN 60079-1: 2007
Certificate : DEKRA 11ATEX0212X
Type of Protection:
Group: II
Category: 2 G
Ex d IIC T6…T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
Ex d IIC T6 Gb (Remote Type Vortex Flow Convertor)
Specification of Protection:
Process Temperature: (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Temperature Class	Process Temperature
T6	-29°C to +80°C
T5	-29°C to +100°C
T4	-29°C to +135°C
T3	-29°C to +200°C
T2	-29°C to +300°C
T1	-29°C to +450°C

*1 Note: Use /HT version above 250°C

Temperature Class: T6 (Remote Type Vortex Flow Convertor)
Ambient Temp.:
–29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
–40 to +60°C (Remote Type Vortex Flow Convertor without indicator)
–30 to +60°C (Remote Type Vortex Flow Convertor with indicator)
Power Supply: 9 to 32Vdc max.
Special Fastener: Class A2-50 or more

• Intrinsically Safe Ex ia

Applicable Standard: EN 50014: 1997 +A1, +A2,
EN 50020: 2002,
EN 60079-27: 2006,
EN 50284: 1999
Certificate: KEMA 03ATEX1136X
Type of Protection: EEx ia IIB/IIC T4...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
EEx ia IIB/IIC T4 (Remote Type Vortex Flow Converter)
Group: II
Category: 1 G
Tamb: –29 to +60°C (Integral Type Vortex Flowmeter)
–29 to +80°C (Remote Type Vortex Flow Detector)
–40 to +60°C (Remote Type Vortex Flow Converter)
For connection to certified Intrinsically Safe circuit with Supply circuit of Integral
Type Flowmeter and Remote Type Converter:
[Entity] Vmax=24V, Imax=250mA, Pi=1.2W, Ci=1.76nF, Li=0

[FISCO (IIC)] Vmax=17.5V, Imax=380mA, Pi=5.32W, Ci=1.76nF, Li=0
[FISCO (IIB)] Vmax=17.5V, Imax=460mA, Pi=5.32W, Ci=1.76nF, Li=0
Connect sensor circuit of DYA and DY-N (/HT)

(Integral Type Vortex Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	60°C	≤135°C
T3	60°C	≤200°C
T2*	60°C	≤300°C
T1*	60°C	≤450°C

*: Use /HT version above 250°C

(Remote Type Vortex Flow Detector)

Temperature Class	Ambient Temperature	Process Temperature
T4	80°C	≤135°C
T3	80°C	≤200°C
T2*	80°C	≤300°C
T1*	80°C	≤450°C

*: Use /HT version above 250°C

• Intrinsically Safe Ex ic

Applicable Standard: EN60079-0: 2009/EN60079-0:2012
EN60079-11:2012
Type of Protection: Ex ic IIC T4…T1 Gc (Integral Type Vortex Flowmeter)
Ex ic IIC T6…T1 Gc (Remote Type Vortex Flow Detector)
Ex ic IIC T5…T4 Gc (Remort Type Voltex Flow Converter)
Groups/Catergory: II 3 G
Enclosure:IP66/67
Overvoltage Category:I
Ambient Temperature:
-29 to +60°C (Integral Type Vortex Flowmeter)
-40 to +80 [79]°C (Remote Type Vortex Flow Detector)
(Option /LT below -29°C, [ ] for Option /MV at T6)
-40 to +80°C (Remote Type Vortex Flow Converter without indicator)
-30 to +80°C (Remote Type Vortex Flow Converter with indicator)

(Integral Type Vortex Flowmeter)

Temperature Class	Process Temperature
T4	-29°C to +135°C
T3	-29°C to +199°C
T2	-29°C to +250°C
T1	–29°C to +250°C

(Remote Type Vortex Flow Detector)

Temperature Class	Process Temperature
T6	–196°C to +84/[+79]°C
T5	–196°C to +100°C
T4	–196°C to +135°C
T3	–196°C to +199°C
T2	–196°C to +299/[+289]°C
T1	–196°C to +449/[+439]°C

*: Use /HT option above 250°C, use /LT option below -29°C, [ ] for /MV option.

Electrical data:
Supply and Output Circuit (SUPPLY + and –);
FISCO Field Device
Entity Concept:
Maximum Input Voltage Ui: 32Vdc
Internal Capacitance Ci: 3.52nF
Internal Inductance Li: 0mH
Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

For the connection of DYA to DY-N :
Maximum cable capacitance: 160nF
Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

Special conditions for safe use

1. For process temperatures above 250°C the flow meters of the /HT version must be used.
2. Because the enclosures of the flow meters and the flow converter are made of aluminium alloy, when used in an potentially explosive atmosphere requiring apparatus of equipment categoly 1 G, they must be installed so, that even in the event of rare incidents, an ignition source due to impact of friction between the enclosure and iron/steel is excluded.

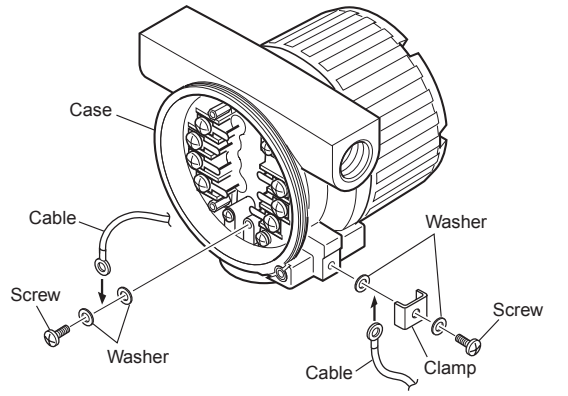
- Precautions shall be taken to minimize the risk from electrostatic discharge of painted parts.
- The dielectric strength of at least 500 V a.c. r.m.s. between the intrinsically safe circuits and the enclosure of the flow meter or the converter is limited only by the overvoltage protection.

■ Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- Use the suitable heat-resisting cables (over 90°C) for the digitalYEWFLO Model DY Series Vortex Flowmeter when the ambient temperature exceeds 60°C and/or the process temperature exceeds 200°C.
- For flameproof; Cable glands, adapters and/ or blanking elements shall be of Ex “d” for Ex “d” installations. They shall be installed so as to maintain the specified degree of protection (IP Code) of the flowmeter.
- For ATEX intrinsically safe Ex ic; Cable glands, adapter and / or blanking elements shall be of Ex “n”, Ex “e”, or Ex “d” and shall be installed so as to maintain the specified degree of protection (IP Code) of the equipment.
- Unused apertures shall be closed with above-mentioned blanking elements (in case of Ex “d” installations).

The grounding terminals are located on the inside and outside of the terminal area.
Connect the cable to grounding terminal in accordance with wiring procedure (1) or (2).



(1) Internal grounding terminal (2) External grounding terminal
F1001.ai

Figure 10.1 Wiring Procedure for Grounding Terminals for Flameproof

■ Operation

WARNING

- Wait 3 min. after power is turned off, before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

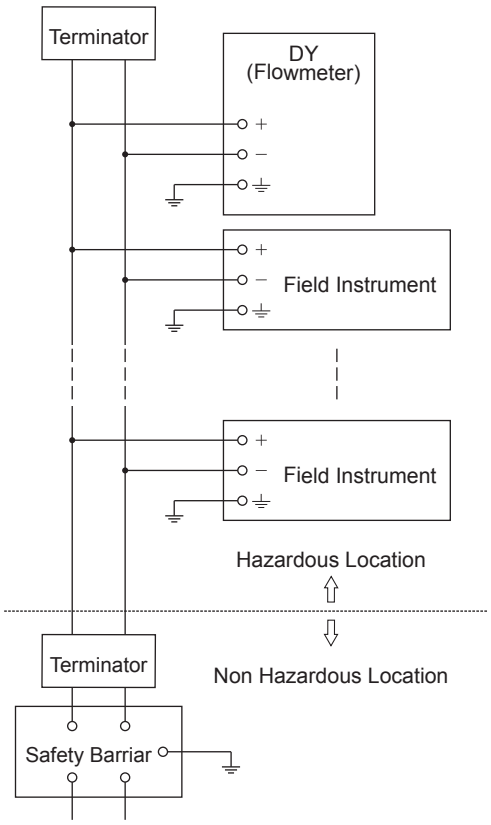
■ Maintenance and Repair

WARNING

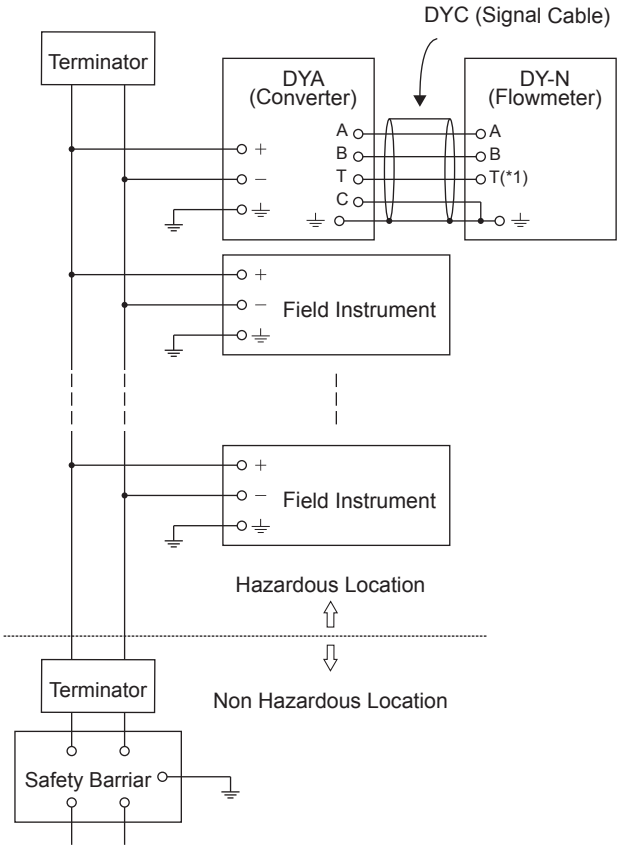
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

■ Installation Diagram of Intrinsically safe (and Note)

[Integral type]



[Remote type]



(*1): Wire for T termanal
With temperature sensor type: Installed
Without temperature sensor type: Not Installed

Note
- In the rating 1, the output current of the barrier must be limited by a resistor 'Ra' such that Io=Uo/Ra.
- In the rating 2, the output of the barrier must be the characteristics of the trapezoid or the rectangle and this transmitter can be connected to Fieldbus equipment which are in according to the FISCO model.
- The terminators may be built-in by a barrier.
- More than one field instrument may be connected to the power supply line.
- The terminator and the safety barrier shall be certified.

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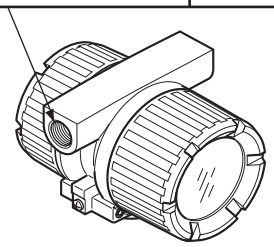
Electrical data

	Ex ia II C		Ex ia II B	Ex ic II C
	Rating1 (Entity)	Rating2 (FISCO)	Rating3 (FISCO)	Rating1 (Entity)
Maximum Input Voltage Ui	24V dc	17.5V dc	17.5V dc	32V dc
Maximum Input Current Ii	250mA	380mA	460mA	—
Maximum Input Power Pi	1.2W	5.32W	5.32W	—
Maximum Internal Capacitance Ci	1.76nF	1.76nF	1.76nF	3.52nF
Maximum Internal Inductance Li	0	0	0	0

■ Screw Marking

The type of electrical connection is stamped near the electrical connection port according to the following codes.

Screw size	Marking
ISO M20 X 1.5 female	⚠ M
ANSI 1/2-14NPT female	⚠ N (for Ex d or Ex ic)
	⚠ A (for Ex ia)



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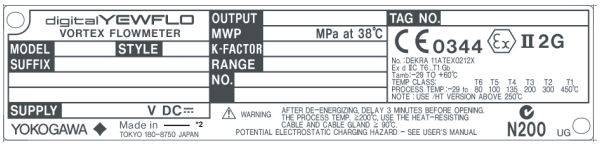
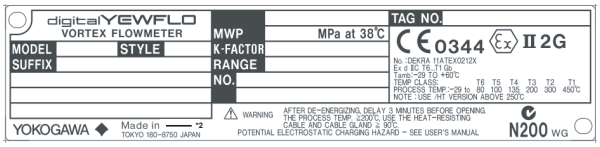
■ Name Plate

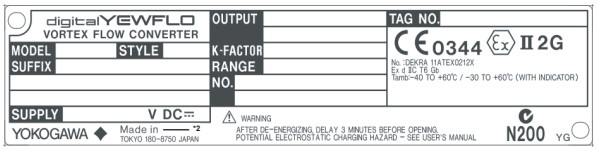
[Integral type, Flameproof]



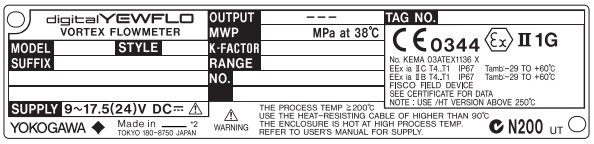
[Remote type detector, Flameproof]



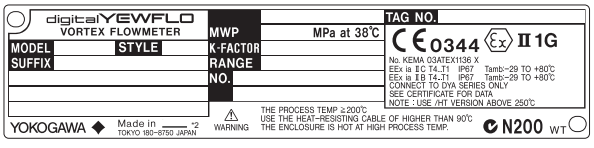
[Remote type converter, Flameproof]



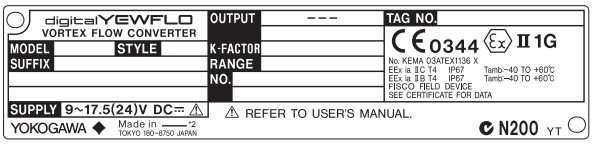
[Integral type, Intrinsically safe Ex ia]



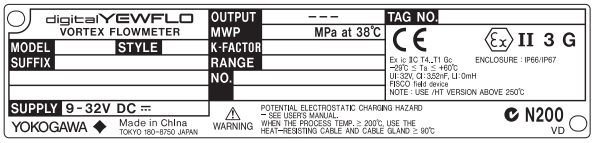
[Remote type detector, Intrinsically safe Ex ia]



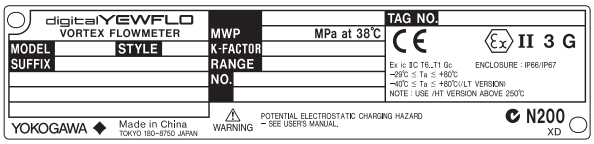
[Remote type converter, Intrinsically safe Ex ia]



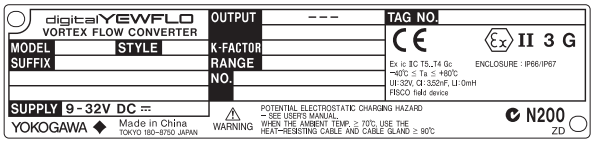
[Integral type, Intrinsically safe Ex ic]



[Remote type detector, Intrinsically safe Ex ic]



[Remote type converter, Intrinsically safe Ex ic]



MODEL: Specified model code
SUFFIX : Specified suffix code
STYLE: Style code
SUPPLY : Supply voltage
OUTPUT : Output signal
MWP : Maximum working pressure
K-FACTOR : Device-specific factor
RANGE: Specified range
NO.: Upper column: Manufacturing serial number *1
Lower column: The year of production
TAG NO. : Specified TAG No.
CE: CE marking
0344: The indentification number of the notified body
II1G: Group II Category 1 Gas atmosphere
II2G: Group II Category 2 Gas atmosphere
II3G: Group II Category 3 Gas atmosphere

*1) The first digit in the final three numbers of the serial number appearing after "NO." on the name plate indicates the year of production. The following is an example of a serial number for a product that was produced in 2014:
NO. S5K965926 4̲35
↑Produced in 2014

*2) The product-producing country

10.2 FM

■ Technical Data

• Explosion Proof

Applicable Standard: FM3600 2011, FM3611 2004, FM3615 2006, FM3810 1989, Including Supplement 1 1995, ANSI/NEMA 250 1991

Type of Protection: Explosion proof for Class I, Division 1, Groups A,B, C and D; Dust-ignition proof for Class II/III, Division 1, Groups E, F,and G.

"SEAL ALL CONDUITS 18 INCHES." " WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED"

Enclosure Rating: Type 4X

Temperature Code: T6

Ambient Temperature: -29 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
-40 to 60°C (Remote Type Vortex Flow Converter)

Power Supply: 9 to 32Vdc (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Converter)

Output Signal (Remote Type Vortex Flow Detector): Output Signal to Converter; 30Vp-p, 100μAp-p

Input/Output Signal (Remote Type Vortex Flow Converter):
Input Signal from Flowmeter; 30Vp-p, 100μAp-p

Electrical connection : ANSI 1/2 NPT female (Special)

• Intrinsically Safe

Applicable Standard: FM3600: 1998, FM3610: 2010, FM3611: 2004, FM3810: 2005, NEMA 250: 1991, ANSI/ISA-60079-0: 2009, ANSI/ISA-60079-11: 2009, ISA 60079-27: 2006

Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G, T4, and Class I, Zone 0, AEx ia IIB/IIC T4, Entity, FISCO
Nonincendive for Class I, II, Div.2, Groups A, B, C, D, F and G, Class III, DIV.1, Class I, Zone 2, Group IIC, FNICO

Ambient Temperature :
–29 to +60°C (Integral Type Vortex Flowmeter)
–29 to +80°C (Remote Type Vortex Flow Detector)
–40 to +60°C (Remote Type Vortex Flow Converter)

Indoors and Outdoors : Type 4X

Electrical Parameters : Intrinsically Safe
[Entity] Vmax=24V, Imax=250mA, Pi=1.2W, Ci=3.52nF, Li=0
[FISCO (IIC)] Vmax=17.5V, Imax=380mA, Pi=5.32W, Ci=3.52nF
[FISCO (IIB)] Vmax=17.5V, Imax=460mA, Pi=5.32W, Ci=3.52nF, Li=0
Nonincendive
Vmax=32V, Ci=3.52nF, Li=0

■ Wiring

• Explosion proof

WARNING

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- "SEAL ALL CONDUITS 18 INCHES" " WHEN INSTALLED DIV.2, SEALS NOT REQUIRED".

• Intrinsically Safe

NOTE

- The FM Approved Hand Held Communicator may be connected at any point in the loop between the digitalYEWFLO and the Control Equipment.

■ Operation

• Explosion proof

WARNING

- Note a warning label worded as follows.
  Warning: OPEN CIRCUIT BEFORE
  REMOVING COVER.
  INSTALL IN ACCORDANCE WITH
  THE INSTRUCTION MANUAL (IM)
  IF6A1-01E.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

■ Maintenance and Repair

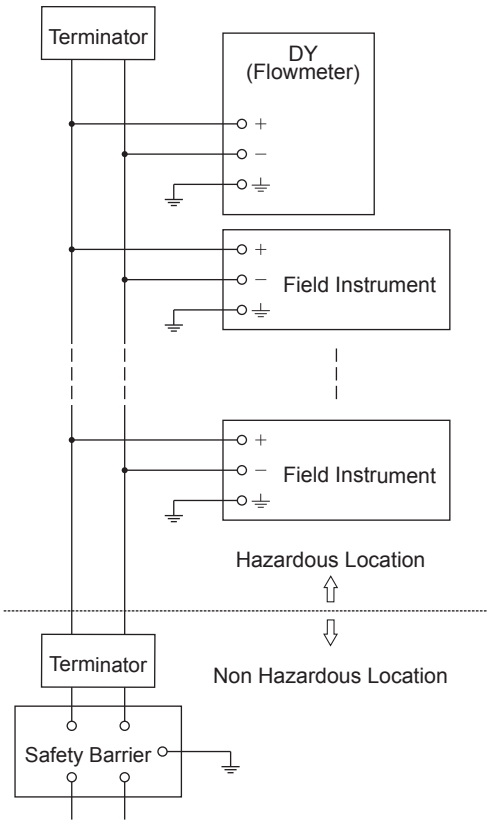
WARNING

- The instrument modification or part replacements by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of FM Approvals.

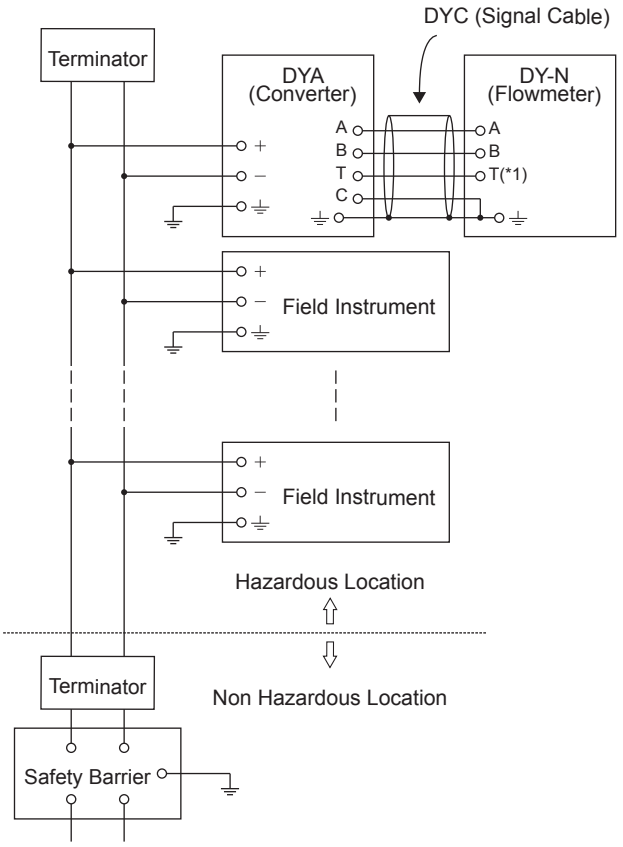
■ Installation Diagram

Intrinsically Safe (and WARNING)

[Integral type]



[Remote type]



(*1) Wire for T terminal
With Temperature sensor type : installed
Without Temperature sensor type : not installed

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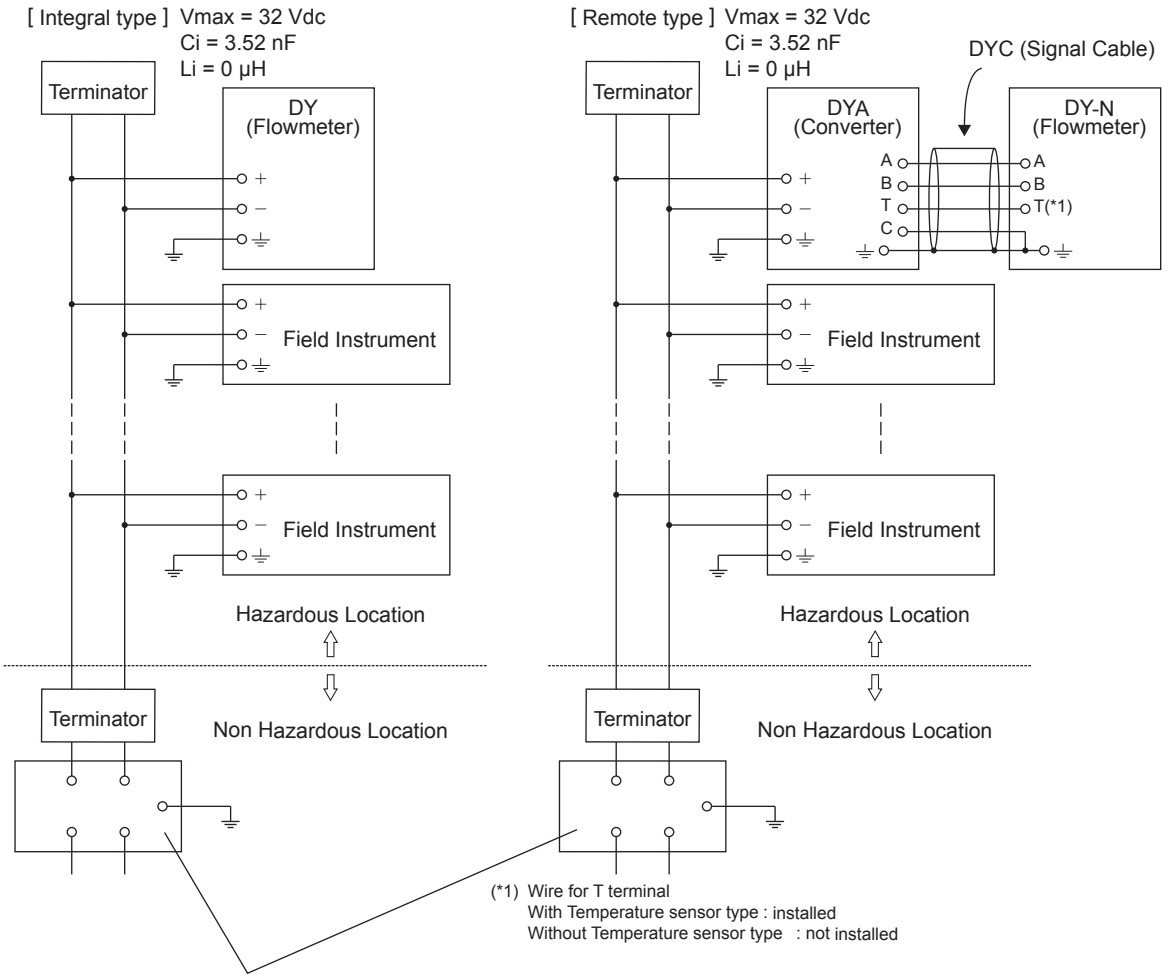
- **FISCO rules**

The FISCO Concept allows the interconnection of intrinsically safe apparatus to Safety Barrier not specifically examined in such combination. The criterion for such interconnection is that the voltage (Vmax), the current (Imax) and the power (Pi) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (Uo, Voc, Vt), the current (1o, Isc, It,) and the power (Po) which can be provided by the Safety Barrier (supply unit). In addition, the maximum unprotected residual capacitance (Ci) and inductance (Li) of each apparatus (other than the terminators) connected to the Fieldbus must be less than or equal to 5nF and 10 µH respectively.
In each I.S. Fieldbus segment only one active source, normally the Safety Barrier, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (Uo, Voc, Vt) of the Safety Barrier used to supply the bus must be limited to the range of 14V d.c. to 24V d.c. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except to a leakage current of 50 µA for each connected device. Separately powered equipment needs a galvanic isolation to insure that the intrinsically safe Fieldbus circuit remains passive.
The cable used to interconnect the devices needs to comply with the following parameters:
Loop resistance R': 15 ... 150 Ω/KM
Inductance per unit length L': 0.4 ... 1mH/km
Capacitance per unit length C': 80 ... 200 nF/km
C' = C' line/line + 0.5 C' line/screen, if both lines are floating
or
C'= C' line/line + C' line/screen, if the screen is connected to one line
Length of spur Cable: max. 30m
Length of trunk cable: max. 1Km
Length of splice: max. 1m
Terminators
At each end of the trunk cable an approved line terminator with the following parameters is suitable:
R = 90 ... 100Ω
C = 0 ... 2.2 µF.
System evaluation
The number of passive devices like transmitters, actuators, connected to a single bus segment is not limited due to I.S. reasons. Furthermore, if the above rules are respected, the inductance and capacitance of the cable need not to be considered and will not impair the intrinsic safety of the installation.

Installation Notes For FISCO and Entity Concepts:

1. The Intrinsic Safety Entity concept allows the interconnection of FM Approved Intrinsically safe devices with entity parameters not specifically examined in combination as a system when:
   Uo or Voc or Vt ≤ Vmax, Io or Isc or It ≤ Imax, Po ≤ Pi. Ca or Co ≥ ∑Ci + ∑Ccable, For inductance use either La or Lo ≥ ∑Li + ∑Lcable or Lc/Rc ≤ (La/Ra or Lo/Ro) and Li/Ri ≤ (La/Ra or Lo/Ro)
2. The Intrinsic Safety FISCO concept allows the interconnection of FM Approved Intrinsically safe devices with FISCO parameters not specifically examined in combination as a system when:
   Uo or Voc or Vt ≤ Vmax, Io or Isc or It ≤ Imax, Po ≤ Pi.
3. The Safety Barrier shall be a linear supply for Entity installations and either a linear supply or a trapezoidal supply for FISCO Installations.
4. Dust-tight conduit seals must be used when installed in Class II and Class III environments.
5. Control equipment connected to the Safety Barrier must not use or generate more than 250 Vrms or Vdc.
6. Installation should be in accordance with ANSI/ISA RP12.06.01 (except chapter 5 for FISCO Installations) "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code® (ANSI/NFPA 70) Sections 504 and 505.
7. The configuration of Safety Barrier must be FM Approved under the associated concept.
8. Safety Barrier manufacturer's installation drawing must be followed when installing this equipment.
9. The (Product Name) Series are Approved for Class I, Zone 0, applications. If connecting AEx[ib] Safety Barrier or AEx ib I.S. Apparatus to the (Product Name) Series the I.S. circuit is only suitable for Class I, Zone 1, or Class I, Zone 2, and is not suitable for Class I, Zone 0 or Class I, Division 1, Hazardous (Classified) Locations."
10. No revision to drawing without prior FM Approval.



FM Approved Associated Nonincendive Field Wiring Apparatus

Vt or Voc
It or Isv
Ca
La

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NOTE

1. Dust-tight conduit seal must be used when installed in Class II and Class III environments.
2. Installation should be in accordance with the National Electrical Code® (ANSI/NFPA 70) Sections 504 and 505.
3. The configuration of Associated Nonincendive Field Wiring Apparatus must be FM Approved.
4. Associated Nonincendive Field Wiring Apparatus manufacturer's installation drawing must be followed when installing this equipment.
5. No revision to drawing without prior FM Approvals.
6. Terminator and supply unit must be FM Approved.
7. If use ordinary wirings, the general purpose equipment must have nonincendive field wiring terminal approved by FM Approvals.
8. The nonincendive field wiring circuit concept allows interconnection of nonincendive field wiring apparatus with associated nonincendive field wiring apparatus, using any of the wiring methods permitted for unclassified locations.
9. Installation requirements;
   Vmax ≥ Voc or Vt
   Imax = see note 10.
   Ca ≥ Ci + Ccable
   La ≥ Li + Lcable
10. For this current controlled circuit, the parameter (Imax) is not required and need not be aligned with parameter (Isc or It) of the barrier or associated nonincendive field wiring apparatus.
11. Approved under FNICO Concept.

Electrical data:
   Vmax = 32V
   Ci = 3.52nF
   Li = 0

10.3 IECEx

WARNING

- Only trained persons use this instrument in industrial locations.
- Electrostatic charge may cause an explosion hazard.
  Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on coating face of product.

■ Technical Data

• Flameproof

Applicable Standard : IEC60079-0: 2007-10,
IEC60079-1: 2007-04
Certificate : IECEx DEK 11.0077X
Type of Protection:
Ex d IIC T6…T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
Ex d IIC T6 Gb (Remote Type Vortex Flow Convertor)
Specification of Protection:
Process Temperature: (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Temperature Class	Process Temperature
T6	-29°C to +80°C
T5	-29°C to +100°C
T4	-29°C to +135°C
T3	-29°C to +200°C
T2	-29°C to +300°C
T1	-29°C to +450°C

*1 Note: Use /HT version above 250°C

Temperature Class: T6 (Remote Type Vortex Flow Convertor)
Ambient Temp.:
–29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
–40 to +60°C (Remote Type Vortex Flow Convertor without indicator)
–30 to +60°C (Remote Type Vortex Flow Convertor with indicator)
Power Supply: 9 to 32Vdc max.
Special Fastener: Class A2-50 or more

Special conditions for safe use

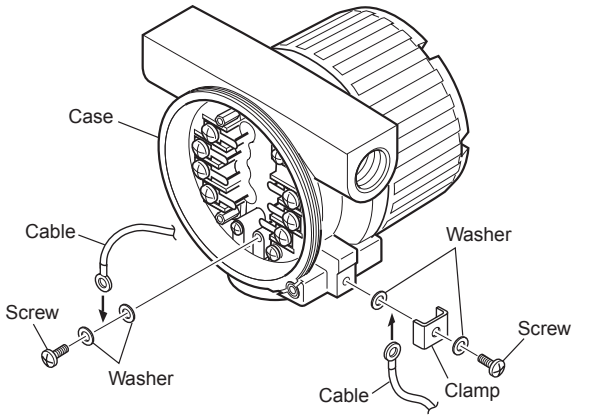
1. For process temperatures above 250°C the flow meters of the /HT version must be used.

■ Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- Use the suitable heat-resisting cables (over 90°C) for the digitalYEWFLO Model DY Series Vortex Flowmeter when the ambient temperature exceeds 60°C and/or the process temperature exceeds 200°C.
- The cable entry devices shall be certified in type of protection flame proof enclosure “d” and suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with certified blanking elements in type of protection flame proof enclose “d”.

The grounding terminals are located on the inside and outside of the terminal area.
Connect the cable to grounding terminal in accordance with wiring procedure (1) or (2).



(1) Internal grounding terminal (2) External grounding terminal

Figure 10.2 Wiring Procedure for Grounding Terminals

■ Operation

WARNING

- Wait 3 min. after power is turned off, before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

■ Maintenance and Repair

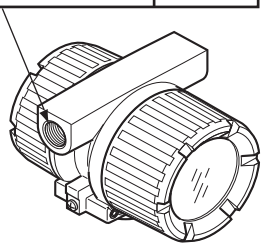
WARNING

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

■ Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following codes.

Screw size	Marking
ISO M20 X 1.5 female	⚠ M
ANSI 1/2-14NPT female	⚠ N



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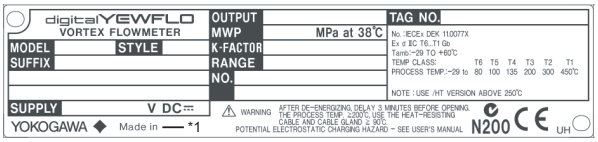
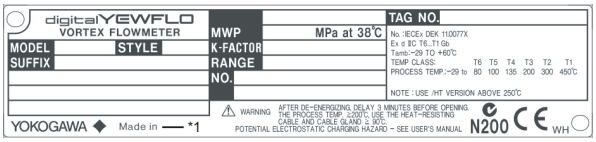
■ Name Plate

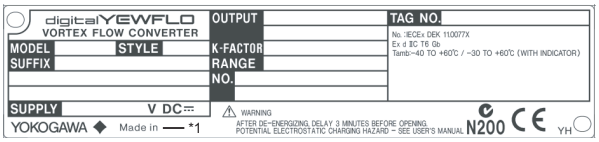
[Integral type, Flameproof]



[Remote type detector, Flameproof]



[Remote type converter, Flameproof]



MODEL: Specified model code
SUFFIX : Specified suffix code
STYLE: Style code
SUPPLY : Supply voltage
OUTPUT : Output signal
MWP : Maximum working pressure
K-FACTOR : Device-specific factor
RANGE: Specified range
NO.: Manufacturing serial number
TAG NO. : Specified TAG No.

*1 The product - producing country

10.4 CSA

■ Technical Data

• Explosion Proof

Applicable Standard: C22.1-98, C22.2 No.0-M1991, C22.2 No.0.4-04, C22.2 No.0.5-1982, C22.2 No. 25-1966, C22.2 No. 30-M1986, C22.2 No. 94-M1991, C22.2 No. 142-M1987, C22.2 No. 61010-1-04, ANSI/ISA-12.27.01-2003

Certificate : 1166201

Type of Protection: Explosion proof for Class I, B, C and D; Class II, Groups E, F and G; Class III. For Class I, Division 2 location:

"FACTORY SEALED, CONDUIT SEAL NOT REQUIRED."

Enclosure : Type 4X

(Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Temperature Code	Ambient Temperature	Process Temperature
T6	60°C	≤85°C
T5	60°C	≤100°C
T4	60°C	≤135°C
T3	60°C	≤200°C
T2	60°C	≤300°C
T1	60°C	≤450°C

Temperature Code: T6 (Remote Type Vortex Flow Converter)

Ambient Temperature: -29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
-40 to +60°C (Remote Type Vortex Flow Converter)

Power Supply: 9 to 32Vdc (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Converter)

Output Signal (Remote Type Vortex Flow Detector): Output Signal; 30Vp-p, 100μAp-p

Input/Output signal (Remote Type Vortex Flow Converter):
Input Signal; 30Vp-p, 100μAp-p

Electrical Connection: ANSI 1/2 NPT female (Special)

■ Dual Seal (Option /CF11)

Dual Seal:

Certified by CSA to the requirement of ANSI/ISA 12.27.01

No additional sealing required.

Primary seal failure annunciation: at the O-ring seal portion between shedder bar and amplifier housing.

10.5 TIIS

Certificate:

Model	Shedder bar Material	Integral Type Flowmeter		Remote Type Detector
		N (None Indicator)	D (With Indicator)	N (None Indicator)
DY015 DY025/R1 DY040/R2	E	TC14901	TC14912	TC14923
	X	TC18903	TC18914	TC18925
DY025 DY040/R1 DY050/R2	E	TC19504	TC19513	TC19522
	X	TC18904	TC18915	TC18926
DY040 DY050/R1 DY080/R2	E	TC19505	TC19514	TC19523
	X	TC18905	TC18916	TC18927
DY050 DY080/R1 DY100/R2	E	TC19506	TC19515	TC19524
	X	TC18906	TC18917	TC18928
DY080 DY100/R1 DY150/R2	E	TC19507	TC19516	TC19525
	X	TC18907	TC18918	TC18929
DY100 DY150/R1 DY200/R2	E	TC19508	TC19517	TC19526
	X	TC18908	TC18919	TC18930
DY150 DY200/R1	E	TC19509	TC19518	TC19527
	X	TC18909	TC18920	TC18931
DY200	E	TC19510	TC19519	TC19528
	X	TC18910	TC18921	TC18932
DY250	E	TC19511	TC19520	TC19529
DY300	E	TC19512	TC19521	TC19530
DY400	B	TC18945	TC18955	TC18965

Model	Shedder bar Material	Remote Type Converter	
		N (None Indicator)	D (With Indicator)
DYA		TC14934	TC14935

	Integral Type Flowmeter		Remote Type Flowmeter	
	None Indicator	With Indicator	Detector	Converter
Construction	Ex d IIC T6	←	←	←
	Flame Proof Approval	←	←	←
Amb.Temp	-20°C up to 60°C	←	←	←
Rating	Maximum power supply vortage: DC42V Current Signal: DC4-20mA Pulse Signal: ON : 2V 200mA OFF : 42V 4mA		Output Voltage: 30Vp-p Output Current: 100μ Ap-p	Maximum power supply vortage: DC42V Current Signal: DC4-20mA Pulse Signal: ON : 2V 200mA OFF : 42V 4mA Input Signal: 30V p-p,100μ A p-p Resistance Temp, Sensor Input: Pt1000 at 0°C Specified Current: less than 1mA

* In case that ambient temperature exceeds 50°C, use heat-resistant cables with maximum allowable temperature of 70°C or above.